

SCIENCE

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THE SPRAGUE ELECTRIC-RAILWAY MOTOR.

WE publish in this issue views of the Sprague improved electric motor for street-railway work. This motor represents the experience of several years in the electric street-railway business, and it is intended to meet all the exigencies in this kind of work. In its manufacture, every detail of mechanical and electrical construction is carefully attended to, and the most recent improvements which experience could suggest have been adopted to meet the necessities of street-car service.

Only one intermediate shaft is used between the armature pinion and the main gear, and the entire reduction is about 12 to 1. All

The armatures are of the type which has been proved to be water-proof, and incapable of injury by moisture. In a recent test upon one of these armatures, made at the Sprague factory at Schenectady, and described in this paper a short time ago, one of these armatures was placed successively in a tub of fresh water and allowed to remain there for twenty-four hours, and in a tub of salt water and allowed to remain there for the same time. After each of these baths, the armature was placed in position in the motor, and the machine was worked to one-third above its normal load, as measured by a dynamometer, for several hours without developing any trouble whatever. These tests proved most conclusively that these machines can be relied upon under all condi

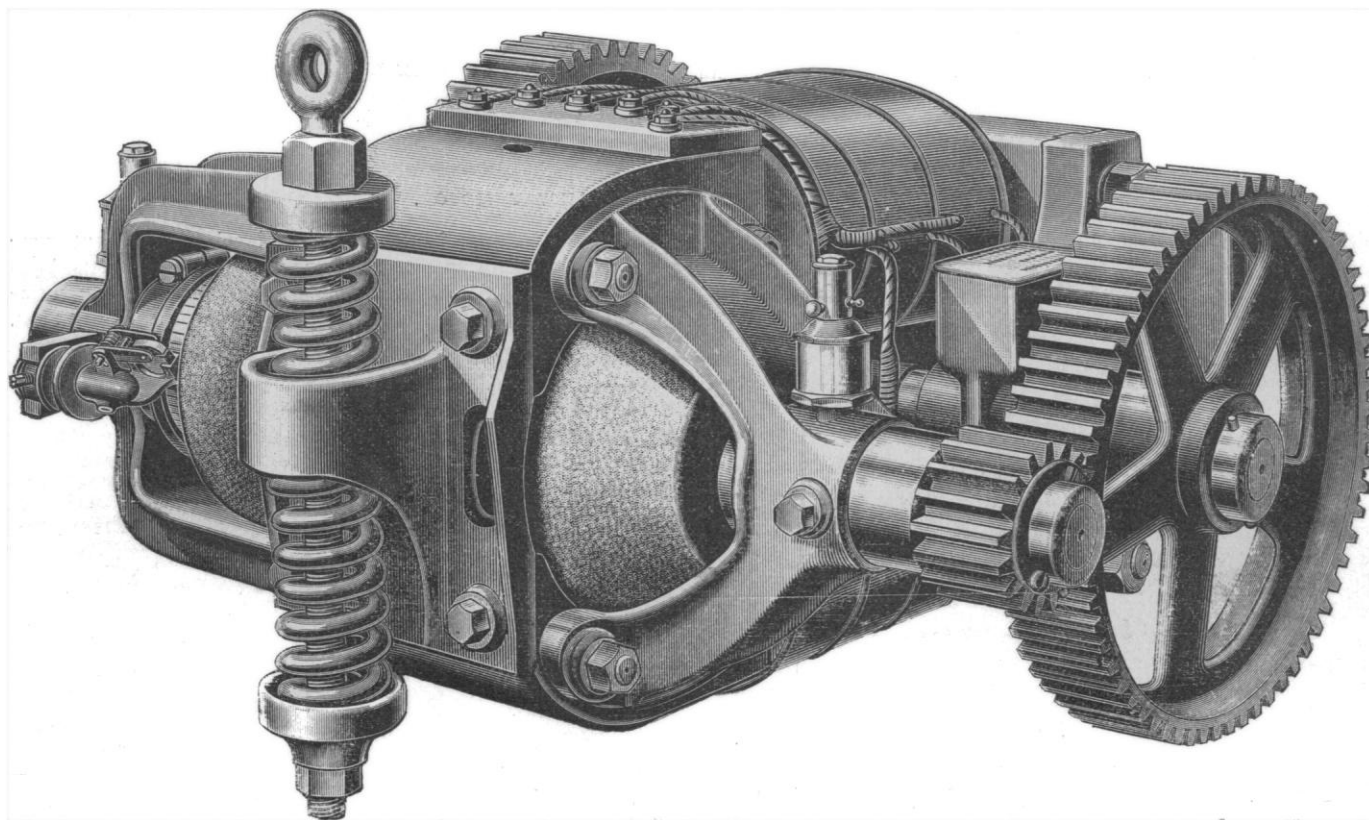


FIG. 1. — NEW SPRAGUE ELECTRIC-RAILWAY MOTOR.

the gears and every part of the motor are made extremely strong and durable, as can be seen in the case of the gears in the engraving, where the general appearance of durability and strength is everywhere marked.

The main gears are of the split-gear pattern, so that in case of necessity they can be easily removed from the shaft without dismounting the machine. The pinion and all the bearings are also constructed so that they can be easily removed if necessary.

Great attention has been paid in this motor to obtain a machine which will require a minimum amount of care, under the unfavorable conditions which motors for street-railway work very often meet in actual practice. For this reason, all the bearings are made completely dust-proof and very durable.

tions of weather, and that they cannot be harmed by moisture or by water splashing upon them from the road-bed.

Another important improvement which has been adopted in this machine is that the field-magnet coils are completely incased in covers, as shown in the engravings, which fully protect the wire from all outside damage. These casings are hermetically closed, so that it is impossible for moisture to affect the coils in any way.

The style of brushes used upon these motors is of a new type, which has been shown to give excellent results in this kind of work.

The Sprague method of flexibly suspending the motors, and of controlling the speed of the motor without the use of any wasteful resistances, is also in use with these motors upon all the roads installed by the Sprague Electric Railway and Motor Company.

A great deal of attention has been paid in the design of this motor, while great care has been taken in regard to durability and strength, to reducing the weight to a minimum. For this purpose, and with this object in view, cast iron has been dispensed

GIRDLING TREES TO IMPROVE FRUITFULNESS.

IN many sections where the soil is moist and rich, fruit-trees grow largely to wood and foliage, and fail to produce fruit until they reach considerable age and size. To discover some means of

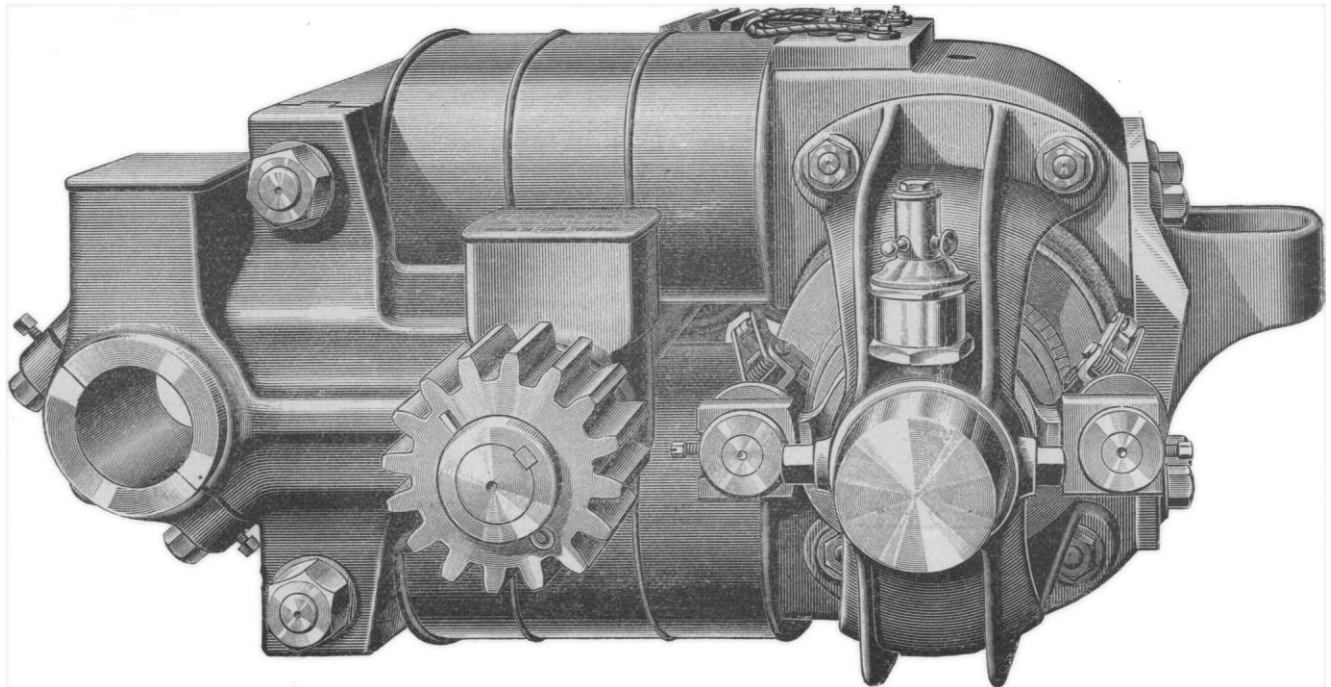


FIG. 2.—NEW SPRAGUE ELECTRIC-RAILWAY MOTOR.

with in the cores and yoke of the field-magnets, and wrought iron substituted.

These motors are already in operation at Wichita (Kan.), Marlborough (Mass.), Cleveland (O.), Cincinnati (O.), Erie (Penn.), At-

lantic City (N.J.), and at one or two other places where they have been installed. They have been shown to give very good results, and in the future this type of motor will be used in all of the Sprague electric-railway installations.

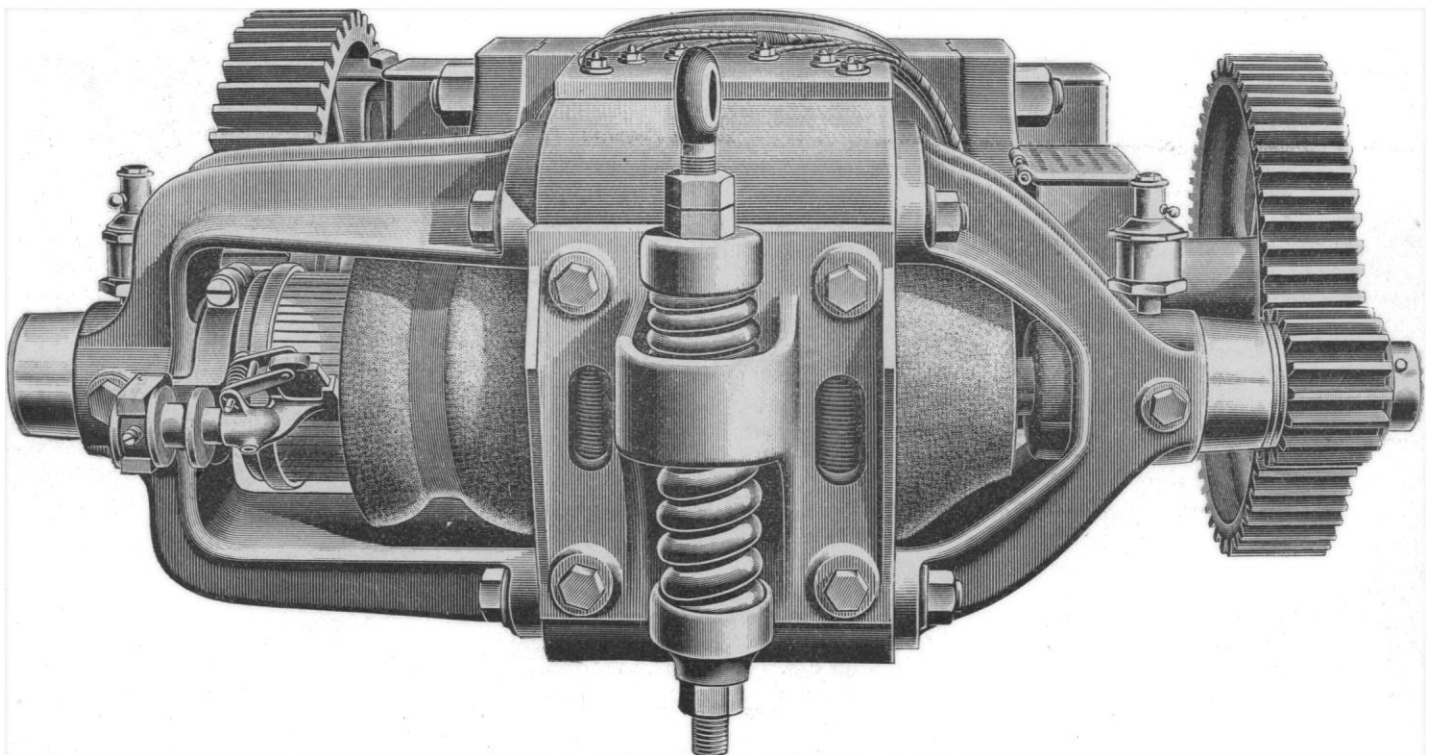


FIG. 3.—NEW SPRAGUE ELECTRIC-RAILWAY MOTOR.

lantic City (N.J.), and at one or two other places where they have been installed. They have been shown to give very good results, and in the future this type of motor will be used in all of the Sprague electric-railway installations.

Three trees were girdled by cutting out a ring of bark $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ inch wide at the ground, July 12, 21, and 29; 2d, Three trees were girdled just below the main branches with the three widths of girdle as in 1st, July 12, 21, and 29; 3d, The same as above was

made on one or more main branches with the three widths of girdle, July 12, 21, and 29.

The results were as follows: 1st, All the girdles made near the ground healed over readily and completely; 2d, Those on the main trunk healed less completely, but sufficiently to insure a good growth of tree and the covering of the injured part in another year; 3d, The girdles made in the branches healed less completely than the last, and in two instances the new growth failed to meet, and consequently the branch died soon after starting growth in the spring; 4th, All showed a marked increase in fruitfulness over those not girdled; 5th, Little difference was observed in the effect of the girdling made at different times or in the various widths of the ring of bark taken out.

No definite conclusion can be made at this time as to the effect of this treatment upon the permanent health of the tree. Observations for many years alone can determine the point.

Reasoning from analogy and from the known laws of plant-growth, this treatment can be advised only upon trees that are planted too closely, and a part of which must be removed after a time, to allow the full development of others, or those in very rich, moist soil which are long coming into bearing.

Cutting rings of bark from the canes of the grape-vine to hasten the time of ripening has been practised more or less for many years to prepare large specimens for exhibition, but only for the few years past has it been practised to hasten the crop for market.

In a series of experiments made in the college vineyard in 1877 and 1878, and recorded in the "Report of the Board of Agriculture of Massachusetts" for 1878 and 1879, it was found that removing a ring of bark early in July, a quarter of an inch wide, resulted in hastening the time of ripening from one to two weeks.

It was also concluded, from very careful tests made at the time, that the increased size and early maturity were not at the expense of the quality, and that as far as could be determined at that time, and which further observations have confirmed, the vines are not materially injured by the girdling.

Girdling has been practised in the college vineyard more or less every year since, with favorable results. The canes that are to be cut away at the fall pruning only have been girdled, to avoid any possibility of injury to vine or root from stopping the downward flow of sap by the girdle.

Some seasons the results of this practice have been more marked than in others, but generally the increased price obtained for the early fruit has much more than paid expenses of the work; and in seasons of early frost, to which many sections of New England are liable, it has made the difference between total failure and fair profit.

To save expense in the work, for the past two years the girdling has been done by twisting a wire very firmly about the canes the last of June, above the point where the cane is to be cut away at the fall pruning.

About No. 20 wire has been found best, and results obtained have been more satisfactory when the wires were put on the last of June or early in July, and twisted very firmly about the cane.

While there is no proof that the vines are in any way injured (notwithstanding that very careful observations have been made for many years), it is not advisable to girdle the entire vine, but to treat only those canes to be cut away at the fall pruning, and leave about one-half of the vine to grow to a natural condition.

LIFE INSURANCE.¹

I HAVE sometimes been a guest at public dinners when I have felt much more at home and at ease than I do now. The last time I was in this room, a few days ago, it was at a meeting of civil engineers, and I had a reasonable confidence that I had as much practice in public speaking, at any rate, as they had. But now, gentlemen, my experience with gentlemen connected with life-insurance companies is that they can talk a great deal more persuasively than I can.

My business and your business, gentlemen, are connected in a great variety of ways.

In the first place, I do not suppose there is any class of men who are more suitable persons to insure their lives than college teachers. They are almost universally poor, and they universally desire to educate their children and bring up their families well. They have a small, fixed income, and it is an income likely to last as long as their working power lasts. And then, again, they know that they generally live pretty long, to a time when their earning power is impaired; and against that time they make provision by endowment insurance. So I have happened to know a good deal about life insurance as seen from the point of view of a college man. For such reasons as I have given you, I am insured myself in three strong companies.

Again: a good many young men are absolutely without resources, but desperately bent on winning an education. Such a young man induces some friend to lend him a thousand or two thousand dollars, and take security in an insurance upon his life. That young man is presumably ambitious, and has a worthy ambition, and, if he has the necessary physique, he is likely to succeed; and to enable a few such young men to succeed in each decade is a great object.

I will mention still another service which I wish life-insurance companies could render. There may be — there are obviously — serious difficulties in the way; but perhaps here is an opening for new business. As your president has stated, it is the development, comfort, and protection of families that insurance chiefly provides for. Now, I have observed that the permanence of families in good station — the continued usefulness of families from generation to generation — can only be preserved in this country by education. Nothing else will answer: no inheritance of money will answer. You can read in the triennial and quinquennial catalogues how families live and die: some families continue to hold leading places in the community, and other families, which once held such places, disappear. The cause, almost uniformly, for their disappearance, is the ceasing of the higher education at some stage in the history of that family. Men who know these things, therefore (and college men are very apt to have their attention drawn to them), desire some means of securing education to their children. If nothing more, many of them would be greatly relieved to be sure that every one of their sons could get four or five hundred dollars a year for the years between eighteen and twenty-four, for instance. And it seems to me that this provision is not beyond the reach of life insurance; namely, that a father, when his boys are three or four years old, could be enabled to be sure that his boys, as they grow up, should have successively the three hundred or four hundred or five hundred dollars a year necessary to make sure of their education. It is a limited kind of endowment which is sought for, — an endowment which, in my judgment, would go very far to secure the stability and effectiveness in the community of families that have once reached a high state of education and cultivation.

I congratulate you, gentlemen, upon the sphere of your activity. I do not know of any business which has to do more exclusively with the best side of human life; and that is a very great pleasure and satisfaction in any man's life, that he has to do with human nature at its best. It seems to me, from what I have heard of the nature of life insurance and the kind of men with whom the agents of life-insurance companies are brought into contact, that my friend President Capen will be likely to tell you later that all life-insurance agents are Universalists. They must feel, I think, that at least all the men that they know who insure their lives are going to be saved.

It is a great privilege also, gentlemen, that your business in life is, after all, the promotion, as the president has said, of the security and happiness of family. I believe that the normal domestic joys are the chief sources of human happiness; and that, as the president has said, on the family rest all the larger human organizations. Therefore, when you work for the security and cultivation and safety of the family, you work for all that is most precious in human society.

THE sixth annual convention of the Association of Official Agricultural Chemists will be held at the Department of Agriculture, Washington, commencing Sept. 10, 1889, at 10 A.M.

¹ A speech at the dinner of the Boston Life Underwriters' Union, April 9, by President C. W. Eliot of Harvard.

THE PRIMITIVE HOME OF THE ARYANS.¹

IN my address to the anthropological section of the British Association in 1887, I stated, that, in common with many other anthropologists and comparative philologists I had come to the conclusion that the primitive home of the Aryans was to be sought in north-eastern Europe. The announcement excited a flutter in the newspapers, many of whose readers had probably never heard of the Aryans before, while others of them had the vaguest possible idea of what was meant by the name.

Unfortunately it is a name which, unless carefully defined, is likely to mislead or confuse. It was first introduced by Professor Max Müller, and applied by him in a purely linguistic sense. The "discovery" of Sanscrit and the researches of the pioneers of comparative philology had shown that a great family of speech existed, comprising Sanscrit and Persian, Greek and Latin, Teutonic and Slav, all of them sister-languages descended from a common parent, of which, however, no literary monuments survived. In place of the defective or cumbersome titles of "Indo-German," "Indo-European," and the like, which had been suggested for it, Professor Max Müller proposed to call it "Aryan,"—a title derived from the Sanscrit *Arya*, interpreted "noble" in later Sanscrit, but used as a national name in the hymns of the Rig-Veda.

It is much to be regretted that the name has not been generally adopted. Such is the case, however, and it is to-day like a soul seeking a body in which to find a habitation. But the name is an excellent one, though the philologists of Germany, who govern us in such matters, have refused to accept it in the sense proposed by its author; and we are therefore at liberty to discover for it a new abode, and to give it a new scientific meaning.

In the enthusiasm kindled by the sight of the fresh world that was opening out before them, the first disciples of the science of comparative philology believed that they had found the key to all the secrets of man's origin and earlier history. The parent-speech of the Indo-European languages was entitled the *Ursprache*, or "Primeval Language;" and its analysis, it was imagined, would disclose the elements of articulate speech, and the process whereby they had developed into the manifold languages of the present world. But this was not enough. The students of language went even further. They claimed not only the domain of philology as their own, but the domain of ethnology as well. Language was confounded with race; and the relationship of tribe with tribe, of nation with nation, was determined by the languages they spoke. If the origin of a people was required, the question was summarily decided by tracing the origin of its language. English is, on the whole, a Teutonic language, and therefore the whole English people must have a Teutonic ancestry. The dark-skinned Bengali speaks languages akin to our own: therefore the blood which runs in his veins must be derived from the same source as that which runs in ours.

The dreams of universal conquest indulged in by a young science soon pass away as facts accumulate and the limit of its powers is more and more strictly determined. The *Ursprache* has become a language of comparatively late date in the history of linguistic development, which differed from Sanscrit or Greek only in its fuller inflexional character. The light its analysis was believed to cast on the origin of speech has proved to be the light of a will-o'-the-wisp, leading astray and perverting the energies of those who might have done more profitable work. The mechanism of primitive language often lies more clearly revealed in a modern Bushman's dialect or the grammar of Eskimo than in that much-vaunted *Ursprache* from which such great things were once expected by the philosophy of human speech.

Ethnology has avenged the invasion of its territory by linguistic science, and has in turn claimed a province which is not its own. It is no longer the comparative philologist, but the ethnologist, who now and again uses philological terms in an ethnological sense, or settles racial affinities by an appeal to language. The philologist first talked about an "Indo-European race." Such an expression could now be heard only from the lips of a youthful ethnologist.

As soon as the discovery was made that the Indo-European languages were derived from a common mother, scholars began to ask where that common mother-tongue was spoken. But it was agreed on all hands that this must have been somewhere in Asia. Theology and history alike had taught that mankind came from the East, and from the East accordingly the *Ursprache* must have come too. Hitherto Hebrew had been generally regarded as the original language of humanity. Now that the Indo-European *Ursprache* had deprived Hebrew of its place of honor, it was natural, if not inevitable, that, like Hebrew, it should be accounted of Asiatic origin. Moreover, it was the discovery of Sanscrit that had led to the discovery of the *Ursprache*. Had it not been for Sanscrit, with its copious grammar, its early literature, and the light which it threw on the forms of Greek and Latin speech, comparative philology might never have been born. Sanscrit was the magician's wand which had called the new science into existence, and without the help of Sanscrit the philologist would not have advanced beyond the speculations and guesses of classical scholars. What wonder, then, if the language which had thus been a key to the mysteries of Greek and Latin, and which seemed to embody older forms of speech than they, should have been assumed to stand nearer to the *Ursprache* than the cognate languages of Europe? The assumption was aided by the extravagant age assigned to the monuments of Sanscrit literature. The poems of Homer might be old; but the hymns of the Veda, it was alleged, mounted back to a primeval antiquity, while the Institutes of Manu represented the oldest code of laws existing in the world.

There was yet another reason which contributed to the belief that Sanscrit was the first-born of the Indo-European family. The founders of comparative philology had been preceded in their analytic work by the ancient grammarians of India. It was from Pāṇini and his predecessors that the followers of Bopp inherited their doctrine of roots and suffixes and their analysis of Indo-European words. The language of the Veda had been analyzed two thousand years ago as no other single language had ever been analyzed before or since. Its very sounds had been carefully probed and distinguished, and an alphabet of extraordinary completeness had been devised to represent them. It appeared as if the elements out of which the Sanscrit vocabulary and grammar had grown had been laid bare in a way that was possible in no other language; and in studying Sanscrit, accordingly, the scholars of Europe seemed to feel themselves near to the very beginnings of speech.

But it was soon perceived that if the primitive home of the Indo-European languages were Asia, they themselves ought to exhibit evidences of the fact. There are certain objects and certain phenomena which are peculiar to Asia, or, at all events, are not to be found in Europe; and words expressive of these ought to be met with in the scattered branches of the Indo-European family. If the parent-language had been spoken in India, the climate in which they were born must have left its mark upon the face of its offspring.

But here a grave difficulty presented itself. Men have short memories, and the name of an object which ceases to come before the senses is either forgotten or transferred to something else. The tiger may have been known to the speakers of the parent-language, but the words that denoted it would have dropped out of the vocabulary of the derived languages which were spoken in Europe. The same word which signifies an oak in Greek, signifies a beech in Latin. We cannot expect to find the European languages employing words with meanings which recall objects met with only in Asia.

How, then, are we to force the closed lips of our Indo-European languages, and compel them to reveal the secret of their birth-place? Attempts have been made to answer this question in two different ways.

On the one hand, it has been assumed that the absence in a particular language, or group of languages, of a term which seems to have been possessed by the parent-speech, is evidence that the object denoted by it was unknown to the speakers. But the assumption is contradicted by experience. Because the Latin *equus* has been replaced by *caballus* in the modern Romanic languages, we cannot conclude that the horse was unknown in western Europe after the fall of the Roman Empire. The native Basque word for

¹ From The Contemporary Review.

a "knife" (*haistoa*) has been found by Prince L.-L. Bonaparte in a single obscure village; elsewhere it has been replaced by terms borrowed from French or Spanish: yet we cannot suppose that the Basques were unacquainted with instruments for cutting until they had been furnished with them by their French and Spanish neighbors. Greek and Latin have different words for "fire:" we cannot argue from this that the knowledge of fire was ever lost among any of the speakers of the Indo-European tongues. In short, we cannot infer from the absence of a word in any particular language that the word never existed in it: on the contrary, when a language is known to us only in its literary form, it is safe to say that it must have employed many words besides those contained in its dictionary.

A good illustration of the impossibility of arriving at any certain results as long as we confine our attention to words which appear in one but not in another of two cognate languages, is afforded by the Indo-European words which denote a sheet of water. There is no word of which it can be positively said that it is found alike in the Asiatic and the European branches of the family. Lake, ocean, even river and stream, go by different names. A doubt hangs over the word for "sea:" it is possible, but only possible, that the Sanscrit *páthas* is the same word as the Greek *πόντος*, the etymology of which is not yet settled. Nevertheless, we know that the speakers of the parent-language must have been acquainted, if not with the sea, at all events with large rivers. *Naus* ("a ship") is the common heritage of Sanscrit and Greek, and must thus go back to the days when the speakers of the dialects which afterwards developed into Sanscrit and Greek still lived side by side. It survives, like a fossil in the rocks, to assure us that they were a water-faring people, and that the want of a common Indo-European word for "lake" or "river" is no proof that such a word may not have once existed.

The example I have just given illustrates the second way in which the attempt has been made to solve the riddle of the Indo-European birthplace. It is the only way in which the attempt can succeed. Where precisely the same word, with the same meaning, exists in both the Asiatic and the European members of the Indo-European family, — always supposing, of course, that it has not been borrowed by either of them, — we may conclude that it also existed in the parent-speech. When we find the Sanscrit *as'was* and the Latin *equus*, the exact phonetic equivalents of one another, both alike signifying "horse," we are justified in believing that the horse was known in the country from which both languages derived their ancestry. Though the argument from a negative proves little or nothing, the argument from agreement proves a great deal.

The comparative philologist has by means of it succeeded in sketching in outline the state of culture possessed by the speakers of the parent-language, and the objects which were known to them. They inhabited a cold country. Their seasons were three in number, perhaps four, and not two, as would have been the case had they lived south of the temperate zone. They were nomad herdsmen, dwelling in hovels, similar, it may be, to the low, round huts of sticks and straw built by the Kabyles on the mountain-slopes of Algeria. Such hovels could be erected in a few hours, and left again as the cattle moved into higher ground with the approach of spring, or descended into the valleys when the winter advanced. The art of grinding corn seems to have been unknown, and crushed spelt was eaten instead of bread. A rude sort of agriculture was, however, already practised; and the skins worn by the community, with which to protect themselves against the rigors of the climate, were sewn together by means of needles of bone. It is even possible that the art of spinning had already been invented, though the art of weaving does not appear to have advanced beyond that of plaiting reeds and withies. The community still lived in the stone age. Their tools and weapons were made of stone or bone; and, if they made use of gold or meteoric iron, it was of the unwrought pieces picked up from the ground, and employed as ornaments. Of the working of metals, they were entirely ignorant. As among savage tribes generally, the various degrees of relationship were minutely distinguished and named, even the wife of a husband's brother receiving a special title; but they could count at least as far as a hundred. They believed in a multitude of ghosts and

goblins, making offerings to the dead, and seeing in the bright sky a potent deity. The birch, the pine, and the withy were known to them; so also were the bear and wolf, the hare, the mouse, and the snake, as well as the goose and raven, the quail and the owl. Cattle, sheep, goats, and swine were all kept. The dog had been domesticated, and in all probability also the horse. Last, but not least, boats were navigated by means of oars, the boats themselves being possibly the hollowed trunks of trees.

This account of the primitive community is necessarily imperfect. There must have been many words, like that for "river," which were once possessed by the parent-speech, but afterwards lost in either the eastern or western branches of the family. Such words the comparative philologist has now no means of discovering: he must accordingly pass them over along with the objects or ideas which they represent. The picture he can give us of the speakers of the primeval Indo-European language can only be approximately complete. Moreover, it is always open to correction. Some of the words we now believe to have been part of the original stock carried away by the derived dialects of Asia and Europe may hereafter turn out to have been borrowed by one of these dialects from another, and not to have been a heritage common to both. It is often very difficult to decide whether we are dealing with borrowed words or not. If a word has been borrowed by a language before the phonetic changes had set in which have given the language its peculiar complexion, or while they were in the course of progress, it will undergo the same alteration as native words containing the same sounds. The phonetic changes which have marked off the High German dialects from their sister-tongues do not seem to go back beyond the fall of the Roman Empire, and words borrowed from Latin before that date will accordingly have submitted to the same phonetic changes as words of native origin. Indeed, when once a word is borrowed by one language from another, and has passed into common use, it soon becomes naturalized, and is assimilated in form and pronunciation to the words among which it has come to dwell. A curious example of this is to be found in certain Latin words which made their way into the Gaelic dialects in the fourth or fifth century. We often find a Gaelic *c* corresponding to a Welsh *p*, both being derived from a labialized guttural or *qu*, and the habit was accordingly formed of regarding a *c* as the natural and necessary representative of a foreign *p*. When, therefore, words like the Latin *pascha* and *purpura* were introduced by Christianity into the Gaelic branch of the Celtic family, they assumed the form of *caisg* and *corcur*.

It is clear that such borrowings can only take place where the speakers of two different languages have been brought into contact with one another. Before the age of commercial intercourse between Europe and India we cannot suppose that European words could have been borrowed by Sanscrit or Persian, or Sanscrit and Persian words by the European languages. But the case is quite otherwise, if, instead of comparing together the vocabularies of the eastern and western members of the Indo-European stock, we wish to compare only western with western, or eastern with eastern. There our difficulties begin, and we must look to history, or botany, or zoölogy for aid. From a purely philological point of view, the English *hemp*, the Old High German *hanf*, the Old Norse *hanpr*, and the Latin *cannabis*, might all be derived from a common source, and point to the fact that hemp was known to the first speakers of the Indo-European languages in north-western Europe. But the botanists tell us that this could not have been the case. Hemp is a product of the East, which did not originally grow in Germany, and consequently both the plant itself and the name by which it was called must have come from abroad. So, again, the lion bears a similar name in Greek and Latin, in German, in Slavonic, and in Celtic. But the only part of Europe in which the lion existed at a time when the speakers of an Indo-European language could have become acquainted with it were the mountains of Thrace, and it must accordingly have been from Greek that its name spread to the other cognate languages of the West.

It has been needful to enter into these details before we can approach the question, "What was the original home of the parent Indo-European language?" They have been too often ignored or forgotten by those who have set themselves to answer the question,

and to this cause must be ascribed the larger part of the misunderstandings and false conclusions to which the inquiry has given birth.

Until a few years ago I shared the old belief that the parent-speech had its home in Asia, probably on the slopes of the Hindu Kush. The fact that the languages of Europe and Asia alike possessed the same words for "winter" and "ice" and "snow," and that the only two trees whose names were preserved by both — the "birch" and the "pine" — were inhabitants of a cold region, proved that this home did not lie in the tropics. But the uplands of the Hindu Kush, or the barren steppes in the neighborhood of the Caspian Sea, or even the valleys of Siberia, would answer to the requirements presented by such words. Taken by themselves, they were fully compatible with the view that the first speakers of the Indo-European tongues were an Asiatic people.

But when I came to ask myself what were the grounds for holding this view, I could find none that seemed to me satisfactory. There is much justice in Dr. Latham's remark that it is unreasonable to derive the majority of the Indo-European languages from a continent to which only two members of the group are known to belong, unless there is an imperative necessity for doing so. These languages have grown out of dialects once existing within the parent-speech itself, and it certainly appears more probable that two of such dialects or languages should have made their way into a new world, across the bleak plains of Tartary, than that seven or eight should have done so. The argument, it is true, is not a strong one, but it raises at the outset a presumption in favor of Europe. Before the dialects had developed into languages, their speakers could not have lived far apart. There is, in fact, evidence of this in the case of Sanscrit and Persian; and a more widely spread primitive community is implied by the numerous languages of Europe than by the two languages of Asia. A widely spread community, however, is less likely to wander far from its original seat than a community of less extent, more especially when it is a community of herdsmen, and the tract to be traversed is long and barren.

Apart from the general prejudice in favor of an Asiatic origin, due to old theological teaching and the effect of the discovery of Sanscrit, I can find only two arguments which have been supposed to be of sufficient weight to determine the choice of Asia rather than of Europe as the cradle of Indo-European speech. The first of these arguments is linguistic; the second is historical, or rather quasi-historical. On the one hand, it has been laid down by eminent philologists that the less one of the derived languages has deflected from the parent-speech, the more likely it is to be geographically nearer to its earliest home. The faithfulness of the record is a test of geographical proximity. As Sanscrit was held to be the most primitive of the Indo-European languages, to reflect most clearly the features of the parent-speech, the conclusion was drawn that that parent-speech had been spoken at no great distance from the country in which the hymns of the *Rig-Veda* were first composed. The conclusion was supported by the second argument drawn from the sacred books of Parsaism. In the *Vendidad* the migrations of the Iranians were traced back through the successive creations of Ormazd to Airyanem Vaéjô, "the Aryan Power," which Lassen localized near the sources of the Oxus and Jaxartes. But Bréal and De Harlez have shown that the legends of the *Vendidad*, in their present form, are late and untrustworthy, — later, in fact, than the Christian era;¹ and, even if we could attach any historical value to them, they would tell us only from whence the Iranians believed their own ancestors to have come, and would throw no light on the cradle of the Indo-European languages as a whole. The first argument is one which I think no student of language would any longer employ. As Professor Max Müller has said, it would suffice to prove that the Scandinavians emigrated from Iceland. But to those who would still urge it, I must repeat what I have said elsewhere. Although in many respects Sanscrit has preserved more faithfully than the European languages the forms of primitive Indo-European grammar, in many other respects the converse is the case. In the latest researches

into the history of Indo-European grammar, Greek holds the place once occupied by Sanscrit. The belief that Sanscrit was the elder sister of the family led to the assumption that the three short vowels *ä*, *ë*, and *ö* have all originated from an earlier *ä*. I was, I believe, the first to protest against this assumption in 1874, and to give reasons for thinking that the single monotonous *ä* of Sanscrit resulted from the coalescence of three distinct vowels. The analogy of other languages goes to show that the tendency of time is to reduce the number of vocalic sounds possessed by a language, not the contrary. In place of the numerous vowels possessed by ancient Greek, modern Greek can now show only five, and cultivated English is rapidly merging its vowel sounds into the so-called "neutral" *ə*. Since my protest the matter has been worked out by Italian, German, and French scholars; and we now know that it is the vocalic system of the European languages rather than of Sanscrit which most faithfully represents the oldest form of Indo-European speech. The result of the discovery, for discovery it must be called, has been a complete revolution in the study of Indo-European etymology, and still more of Indo-European grammar; and whereas ten years ago it was Sanscrit which was invoked to explain Greek, it is to Greek that the "new school" now turns to explain Sanscrit. The comparative philologist necessarily cannot do without the help of both. The greater the number of languages he has to compare, the sounder will be his inductions; but the primacy which was once supposed to reside in Asia has been taken from her. It is Greek, and not Sanscrit, which has taught us what was the primitive vowel of the reduplicated syllable of the perfect and the augment of the aorist, and has thus narrowed the discussion into the origin of both.

Until quite recently, however, the advocates of the Asiatic home of the Indo-European languages found a support in the position of the Armenian language. Armenian stands midway, as it were, between Persia and Europe, and it was imagined to have very close relations with the old language of Persia. But we now know that its Persian affinities are illusory, and that it must really be grouped with the languages of Europe. What is more, the decipherment of the cuneiform inscriptions of Van has cast a strong light on the date of its introduction into Armenia. These inscriptions are the records of kings whose capital was at Van, and who marched their armies in all directions during the ninth, eighth, and seventh centuries before our era. The latest date that can as yet be assigned to any of them is B.C. 640. At this time there were still no speakers of an Indo-European language in Armenia. The language of the inscriptions has no connection with those of the Indo-European family, and the personal and local names occurring in the countries immediately surrounding the dominions of the Vannic kings, and so abundantly mentioned in their texts, are of the same linguistic character as the Vannic names themselves.

The evidence of classical writers fully bears out the conclusions to be derived from the decipherment of the Vannic inscriptions. Herodotus (vii. 73) tells us that the Armenians were colonists from Phrygia, the Phrygians themselves having been a Thracian tribe which had migrated into Asia. The same testimony was borne by Eudoxos,¹ who further averred that the Armenian and Phrygian languages resembled one another. The tradition must have been recent in the time of Herodotus, and we shall probably not go far wrong if we assign the occupation of Armenia by the Phrygian tribes to the age of upheaval in western Asia which was ushered in by the fall of the Assyrian Empire. Professor Fick has shown that the scanty fragments of the Phrygian language that have survived to us belong to the European branch of the Indo-European family, and thus find their place by the side of Armenian.

Instead, therefore, of forming a bridge between Orient and Occident, Armenian represents the furthestmost flow of Indo-European speech from West to East. And this flow belongs to a relatively late period. Apart from Armenian, we can discover no traces of Indo-European occupation between Media and the Halys until the days when Iranian Ossetes settled in the Caucasus, and the mountaineers of Kurdistan adopted Iranian dialects. I must reiterate here what I have said many years ago: if there is one fact which the Assyrian monuments make clear and indubitable, it is that up to the closing days of the Assyrian monarchy no Indo-European

¹ Bréal, *Mélanges de Mythologie et de Linguistique* (1878), pp. 187-215; De Harlez, *Introduction à l'Etude de l'Avesta*, pp. cxcii., 397. Compare Darmesteter's *Introduction to the Zend-Avesta*, part 1, in *The Sacred Books of the East*.

¹ According to Eustathios (*in Dion.* v. 694).

languages were spoken in the vast tract of civilized country which lay between Kurdistan and western Asia Minor. South of the Caucasus they were unknown until the irruption of the Phrygians into Armenia. Among the multitudinous names of persons and localities belonging to this region which are recorded in the Assyrian inscriptions during a space of several centuries, there is only one which bears upon it the Indo-European stamp. This is the name of the leader of the Cimmerians, — a nomad tribe from the north-east which descended upon the frontiers of Assyria in the reign of Esar-haddon, and was driven by him into Asia Minor. The fact is made the more striking by the further fact, that, as soon as we clear the Kurdish ranges and enter Median territory, names of Indo-European origin meet us thick and fast. We can draw but one conclusion from these facts. Whether the Indo-European languages of Europe migrated from Asia, or whether the converse were the case, the line of march must have been northward of the Caspian, through the inhospitable steppes of Tartary and over the snow-covered heights of the Ural Mountains.

An ingenious argument has lately been put forward, which at first sight seems to tell in favor of the Asiatic origin of Indo-European speech. Dr. Penka has drawn attention to the fact that several of the European languages agree in possessing the same word for "eel;" and that, whereas the eel abounds in the rivers and lakes of Scandinavia, it is unknown in those cold regions of western Asia where, as we have seen, it has been proposed to place the cradle of the Indo-European family. But it is a curious fact that in Greek and Latin, and apparently also in Lithuanian, the word for "eel" is a diminutive derived from a word which denotes a snake or snake-like creature. This, it has been urged, may be interpreted to mean that the primeval habitat of the Indo-European languages was one where the snake was known but the eel was not. The argument, however, cannot be pressed. We all agree that the first speakers of the Indo-European languages lived on the land, not on the water, and that they were herdsmen rather than fishermen. Naturally, therefore, they would become acquainted with the snake before they became acquainted with the eel, however much it might abound in the rivers near them, and its resemblance to the snake would lend to it its name. In Celtic the eel is called "a water-snake," and to this day a prejudice against eating it on the ground that it is a snake exists in Celtic districts. All we can infer from the diminutives *anguilla*, ἔγχελυς, is that the Italians and Greeks in the first instance gave the name to the fresh-water eel, and not to the huge conger.

I cannot now enter fully into the reasons which have led me gradually to give up my old belief in the Asiatic origin of the Indo-European tongues, and to subscribe to the views of those who would refer them to a northern European birthplace. The argument is a complicated one, and is necessarily of a cumulative character. The individual links in the chain may not be strong, but collectively they afford that amount of probability which is all we can hope to attain in historical research. Those who wish to study them may do so in Dr. Penka's work on the "Herkunft der Arier," published in 1886. His hypothesis that southern Scandinavia was the primitive "Aryan home" seems to me to have more in its favor than any other hypothesis on the subject which has as yet been put forward. It needs verification, it is true; but if it is sound, the verification will not be long in coming. A more profound examination of Teutonic and Celtic mythology, a more exact knowledge of the words in the several Indo-European languages which are not of Indo-European origin, and the progress of archæological discovery, will furnish the verification we need.

Meanwhile it must be allowed that the hypothesis has the countenance of history. Scandinavia, even before the sixth century, was characterized as "the manufactory of nations;"¹ and the voyages and settlements of the Norse vikings offer an historical illustration of what the prehistoric migrations and settlements of the speakers of the Indo-European languages must have been. They differed from the latter only in being conducted by sea, whereas the prehistoric migrations followed the valleys of the great rivers. It was not until the age of the Roman Empire that the northern nations became acquainted with the sailing-boat; our English

"sail" is the Latin *sagulum* ("the little cloak of the soldier") borrowed by the Teutons along with its name, and used to propel their boats in imitation of the sails of the Roman vessels. The introduction of the sail allowed the inhabitants of the Scandinavian "hive" to push boldly out to sea, and ushered in the era of Saxon pirates and Danish invasions.

Dr. Penka's arguments are partly anthropological, partly archæological. He shows that the Celts and Teutons of Roman antiquity were the tall, blue-eyed, fair-haired, dolichocephalic race which is now being fast absorbed in Celtic lands by the older inhabitants of them. The typical Frenchman of to-day has but little in common with the typical Gaul of the age of Cæsar. The typical Gaul was, in fact, as much a conqueror in Gallia as he was in Galatia, or, as modern researches have shown, as the typical Celt was in Ireland. It seems to have been the same in Greece. Here, too, the golden-haired hero of art and song was a representative of the ruling class, of that military aristocracy which overthrew the early culture of the Peloponnese, and of whom tradition averred that it had come from the bleak North. Little trace of it now remains: it is rarely that the traveller can discover any longer the modern kinsfolk of the golden-haired Apollo or the blue-eyed Athênê.

If we would still find the ancient blonde race of northern Europe in its purity, we must go to Scandinavia. Here the prevailing type of the population is still that of the broad-shouldered, long-headed blondes who served as models for the Dying Gladiator. And it is in southern Scandinavia alone that the prehistoric tumuli and burying-grounds yield hardly any other skeletons than those of the same tall dolichocephalic race which still inhabits the country. Elsewhere such skeletons are either wanting or else mixed with the remains of other races. It is therefore reasonable to conclude that it was from southern Scandinavia that those bands of hardy warriors originally emerged who made their way southward and westward, and even eastward; the Celts of Galatia penetrating, like the Phrygians before them, into the heart of Asia Minor. The Norse migrations in later times were even more extensive, and what the Norse vikings were able to achieve could have been achieved by their ancestors centuries before.

Now, the Celts and Teutons of the Roman age spoke Indo-European languages. It is more probable that the subject populations should have been compelled to learn the language of their conquerors than that the conquerors should have taken the trouble to learn the language of their serfs. We know, at any rate, that it was so in Ireland. Here the old "Ivernian" population adopted the language of the small band of Celtic invaders that settled in its midst. It is only where the conquered possess a higher civilization than the conquerors, above all, where they have a literature and an organized form of religion, that Franks will adapt their tongues to Latin speech, or Manchus learn to speak Chinese. Moreover, in southern Scandinavia, where we have archæological evidence that the tall blonde race was scarcely at any time in close contact with other races, it is hardly possible for it to have borrowed its language from some other people. The Indo-European languages still spoken in the country must, it would seem, be descended from languages spoken there from the earliest period to which the evidence of human occupation reaches back. The conclusion is obvious: southern Scandinavia and the adjacent districts must be the first home and starting-point of the western branch of the Indo-European family.

If we turn to the eastern branch, we find that the farther east we go, the fainter become the traces of the tall blonde race, and the greater is the resemblance between the speakers of Indo-European languages and the native tribes. In the highlands of Persia, tall, long-headed blondes with blue eyes can still be met with; but, as we approach the hot plains of India, the type grows rarer and rarer until it ceases altogether. An Indo-European dialect must be spoken in India by a dark-skinned people before it can endure to the third and fourth generation. As we leave the frontiers of Europe behind us, we lose sight of the race with which Dr. Penka's arguments would tend to connect the parent-speech of the Indo-European family.

I cannot now follow him in the interesting comparison he draws between the social condition of the southern Scandinavians as dis-

¹ "Quasi officina gentium aut certe velut vagina nationum."—Jordanes, *De Getarum sive Gothorum origine*, ed. Closs, C. 4.

closed by the contents of the prehistoric "kitchen-middens," and the social condition of the speakers of the Indo-European parent-speech according to the sobered estimate of recent linguistic research. The resemblance is certainly very striking; though, on the other hand, it cannot be denied that archæological science is still in its infancy, and that Dr. Penka too often assumes that a word common to the European languages belonged to the parent-speech,—an assumption which will not, of course, be admitted by his opponents.

What more nearly concerns us here, however, is the name we should give to the race or people who spoke the parent-language. We cannot call them "Indo-Europeans:" that would lead to endless ambiguities, while the term itself has already been appropriated in a linguistic sense. Dr. Penka has called them "Aryans," and I can see no better title with which to endow them. The name is short; it has already been used in an ethnological as well as in a linguistic sense; and, since our German friends have rejected it in its linguistic application, it is open to every one to confine it to a purely ethnological meaning. I know that the author has protested against such an application of the term; but it is not the first time that a father has been robbed of his offspring, and he cannot object to the robbery when it is committed in the cause of science. For some time past the name of "Aryan" has been without a definition, while the first speakers of the Indo-European parent-speech have been vainly demanding a name; and the priests of anthropology cannot do better than lead them to the font of science, and there baptize them with the name of "Aryan."

A. H. SAYCE.

THE GRAIN PLANT-LOUSE.

THE present season is characterized by one of those widespread and very damaging insect-invasions that are so discouraging to the farmer, this time an onslaught on the wheat-crop by the grain *Aphis* or plant-louse, *Aphis avenæ*. This louse attacks wheat, barley, oats, and rye, and is to be found in small numbers on these grains every year. This year occurs one of those terrible attacks that seem to threaten very serious loss, extending from Ohio west to Indiana, and north to Grand Rapids, Mich. So abundant are these lice, that they have attracted wide attention and awakened serious alarm. For the last two weeks in June Mr. A. J. Cook, of the Agricultural College of Michigan, received daily numerous specimens of these lice with the inquiry, "What is to be the outcome of this attack?"

This is not the first season that this *Aphis avenæ* has come like a destroying flood upon the grain-fields. In 1861 the lice swarmed upon the cereal crops of New England and New York, at which time Dr. Asa Fitch fully described it in his sixth report. In 1866, and again ten years later, it did great damage in various sections of the West. We see, then, that this louse does not come yearly, but only at long intervals. Why is this? It is doubtless owing in some measure to the weather, but more to its insect enemies. Its enormous prolificness would make it as the sands of the seashore every year, except that some natural agent held it in check. Fitch describes three such enemies. Even now, as we visit the oat and wheat fields, we find many forms different from any previously described. These have short, rounded bodies, which are of a dirty-white color. The cause of this is that these are attacked by parasites, which are eating them up. These little benefactors are now busily engaged in the fields, laying the eggs that will destroy the lice. These minute parasitic insects lay a great many eggs, one in each louse, and their presence and prosperity mark the doom of the lice. Thus through the agency of these minute parasitic forms, aided by climatic influences, we are to be saved from a raid by this grain *Aphis* next year, and will be greatly benefited this year. Indeed, in some cases, these little friends will very likely save us from serious damage. Why the parasites are not able to come successfully to the rescue each year is still unknown. Dry weather is a great promoter of insect productiveness. It is more than probable that the exceeding drought of 1887, 1888, and of the April and May just past, together with the mild winter of 1888-1889, have had much to do with the present invasion. We might expect much aid from the frequent

June rains, but they were perhaps too late. Observation shows that the lice are more than holding their own: so we may conclude that the warm rains are not greatly depleting their ranks.

Where the lice are very numerous, as they seem to be over a widespread area of our country, they must do great injury. Where ten or twelve lice are collected about a single kernel of wheat, there is little hope for that kernel. Mr. Cook has counted one hundred and sixty lice on a single head of wheat. It is hoping too much of the little parasitic flies to expect them to save the present crop. We can but expect much injury, especially where the lice are in such countless numbers as are now seen in many of the wheat-fields of Indiana, Ohio, and Michigan.

The excellent specific against plant-louse ravages, the kerosene and soap mixture, cannot be used without much injury to the crop. To apply it might be like the jump from frying-pan to fire. Again: the lice are so protected by the close cluster of the kernels, that very likely the remedy would not be fully effective.

The name "green midge," which is going the rounds of the papers, is very incorrect, and should not be used. The Hessian-fly and wheat-midge are very different insects. These midges are two-winged flies, whose larvæ are footless maggots. They belong to the great two-winged fly order, *Diptera*, while these are plant-lice or *Aphides*, and belong to the order of bugs, or *Hemiptera*. Let all speak of this as the grain *Aphis*, or plant-louse, and not as the green midge, which is entirely wrong, as they are not always even green in color.

NOTES AND NEWS.

A SPECIAL limited Pullman train with dining and composite cars will leave the foot of Chambers Street, New York, via the Erie Railroad, on Monday, Aug. 5, at 9 o'clock A.M., for the accommodation of the members of the National Electric Light Association and their friends, who will attend the convention at Niagara Falls, Aug. 6, 7, and 8. One car will be reserved for gentlemen accompanied by ladies. Tickets on this train, including Pullman service, will cost ten dollars each. Return tickets (to be obtained at Niagara Falls), including Pullman service, will cost four dollars and sixty cents each. As the cost of this train must be guaranteed the road, all members are urged to remit ten dollars to the secretary at the earliest possible moment, for which they will receive their railway-tickets and Pullman seat-checks by return mail. Tickets may also be obtained at the offices of the *Electrical Review*, 13 Park Row, and the *Electrical World*, Times Building.

— The Boston *Herald* says that "some figures presented at the meeting of the United States Brewers' Association show a wonderful growth of the business during the last twenty-five years. For instance, receipts of the government from the internal revenue tax on fermented liquors amounted to about \$1,500,000 in 1863, when the tax was first imposed. In 1866 the figures rose to \$5,000,000; in 1879, to \$10,000,000; in 1882, to \$15,000,000; and last year the tax amounted to \$23,000,000. The quantity increased in the same ratio from 2,000,000 barrels in 1863 to over 24,000,000 in 1888. At this rate of growth, it is small wonder that Englishmen think they see a chance of making money by buying up American breweries."

— The San Francisco *Chronicle* says that "some of the New York dealers in California wines assert that the reason why the price of our wines in the East is so low is that growers dump quantities of sick wine on the market, and spoil the tone of the California product. They say that the grower sends on several hundred barrels of wine, which arrives in New York sick with the voyage, if not altogether sour, necessitating rest and new barrels before it is salable at all. These dealers go on to say, 'Perhaps the grower has no warehouse, no time to wait, no change of cooperage, no other wine to mix with: therefore he puts his wine on the market at a ridiculous price below what cooperage, freight, and insurance cost. He makes no money, and the buyer is disgusted with California wine.'"

— The French minister of commerce has appointed a committee for the purpose of organizing an international photographic congress to be held during the Paris Exhibition. The committee, headed by the well-known astronomer, Professor Janssen, have

already commenced work. The congress will meet from Aug. 6 to Aug. 17, and discuss the following subjects: (1) introduction of a uniform photometric unit; (2) uniform measurements of focal lengths of objectives; (3) a uniform scale for the determination of the photometric effect of objective diaphragms; (4) uniform periods of exposure in instantaneous work; (5) the adoption of a uniform and easily applicable method for fitting different objectives on to cameras; (6) a universal form of plate; (7) a uniform terminology for photographic operations; (8) universal agreement of photographic formulæ; (9) uniform adjustment of customs procedure with regard to substances sensitive to light; and (10) protection of artistic copyright in photographic works. A conference, in which the work of the congress will be publicly discussed, is to take place on Aug. 20.

— The extreme summit of the Eiffel Tower consists of a small circular gallery less than six feet in diameter, and surrounded by a hand-rail. The floor is three hundred metres above the ground, and from the centre rises the rod that serves as a lightning conductor and flagstaff. In this small gallery M. Mascart presides over the Bureau Central Météorologique established there. The instruments comprise a registering thermometer and hygrometer, a psychrometer, and several maximum and minimum thermometers. There are, in addition, a set of Richards's thermometers and hygrometers that constantly transmit their readings electrically to the Arts Libéraux building, where they are recorded. Outside the gallery are placed a recording actinometer and rain-gauge, and sixty feet below is a large registering barometer. An admirably installed anemometer forms a part of the apparatus. It is mounted on a rod about ten feet high. The vanes, which are of aluminium, are mounted so as to move under the lightest wind-current. Electrical contacts are so arranged as to record each displacement of air of one metre, each displacement of fifty metres, and each of five kilometres. These contacts transmit the effects to the ground station, where they are recorded in speeds per second. A number of other apparatus are included in this very complete laboratory, which has been in regular working for some time. It was asserted, as one of the many objections raised against the Eiffel Tower, that the oscillations at the summit would, under certain unfavorable conditions, be dangerous: it is therefore satisfactory to record, that, with the highest wind-velocities yet observed, the movement at the summit of the tower is hardly appreciable.

— The high temperature produced during the slaking of lime has been but rarely utilized except as an agent in matters of accident in setting fire to vessels and to buildings. *Engineering* adds to these the ordinary method of the helpers to masons, who warm up the coffee for their dinner in cold weather by placing the pail of coffee on a lump of lime, sprinkling on a little water, and watching it carefully to see that it does not boil too hard. Many years ago, before the invention of the diving-bell, a large wager was made between two gentlemen in regard to the possibility of one cooking a pudding at the bottom of the Thames. The winner had his pudding placed in the middle of a large sack of lime, lowered to the bottom of the river, and in due time pulled up, with the result of finding that the conditions of the wager, in regard to the cooking of the pudding, had been fully carried out. But of late lime has been frequently used to remove the frost from the ground in winter, and also to melt out water-pipes; as it has been found that a heap of lime laid on the earth, wet slightly, and covered over with blankets and other non-conducting materials, will draw the frost out of the ground. This is the complement of the process of facilitating engineering work in quicksand by means of the freezing processes frequently used for such purposes.

— With regard to the accident which has occurred to the German Navy at Apia, H. E. Gunther, in the *Photographic News*, says, it might be advisable to refer once more to the theory of Dr. Zenger of Prague, who suggested, as it will be remembered, to make use of photography for the prediction of the weather. According to the doctor, photographs of the sun taken on orthochromatic plates offer a most infallible means to indicate with almost absolute certainty the approaching atmospheric and subterranean disturbances at least twenty-four hours before their setting in. In

these photographs zones are often to be seen around the sun's disk, — i.e., rings of circular or elliptical form, of white or grayish color, — and if these zones appear of very large diameter, and of unusual heaviness, this indicates that violent storms, thunderstorms, or magnetical disturbances will soon set in at the place of observation. At every ship's station should therefore be established a small photographic laboratory, in which photographs of the sun could be taken as often as possible. A much more reliable prediction of the weather would be afforded by this means than by the aid of the barometer now generally in use for this purpose, and precautions could therefore be taken in good time.

— The "Fourth Annual Report of the Maine State Board of Health" is now in press, and will be distributed as soon as possible. Among the papers which it will contain are, "Small-Pox at Cumberland Mills;" "Diphtheria at the Insane-Hospital;" "Typhoid-Fever at Washburn;" "Circulars;" "Water-Analysis;" "Public Water-Supplies;" "Pneumonia as an Infectious or Epidemic Disease;" "Epidemic Jaundice;" "Cerebro-Spinal Meningitis;" "As to the Infectiousness of Diphtheria;" "On the Identity of Croup and Diphtheria;" "On the Filtering Capacity of the Soil;" "Public Health Work in Portland;" "Light Gymnastics for Schools;" "Pollution of Water-Supplies;" "As to the Spontaneity of Infectious Diseases."

— In 1886 the Prince of Monaco, wishing to study the course of the Gulf Stream, threw into it some copper flasks from the "Hirondelle." Three of these flasks have come ashore on the south coast of Iceland, — two near the O Mountains, in the Rangárvall district; and the third at Flöj, in the Arnaes district.

— At a recent meeting of the Scientific Society of Copenhagen, says *Nature*, Professor Steenstrup gave an account of the results of his examination, last year, of the great mammoth deposit at Predmost, in Moravia. Dr. Wankel and Professor Maschka, who have devoted much attention to the subject, are of opinion that the mammoths whose remains are found in this district were killed by man, and that their bodies were dragged thither to be eaten. Professor Steenstrup, on the contrary, holds that the mammoths themselves sought the locality, and that they must have died from want of water, or from some other cause with which man had nothing to do. The splits in the remains are due, he thinks, to the action of water and sand, and afford no support to the notion that the knuckles were cleft for the sake of the marrow. It is certain that some of the bones have been exposed to the action of fire; but Professor Steenstrup maintains that the traces of fire may be due to the fact that fires were at one time lighted upon them. On some of them, decorative lines have been scratched, but these may have been made long after the mammoth was extinct in Moravia. The lines, according to Professor Steenstrup, are identical with the ornamentation of pottery of the neolithic age.

— In his last "Meteorological Report for India," Mr. Elliot, referring to sun-spots and weather in India, — a subject which has been frequently mentioned in these reports, says, "So far as India is concerned, it would appear that it is the period of minimum sun-spots which is associated with the largest and most abnormal variations of meteorological conditions and actions. Thus exceptionally heavy snow fell in the North-West Himalayas in the winter of 1866, and again in 1876 and 1877. The latter is to some extent described in the annual reports on the meteorology of India for these two years. Again: the most striking and disastrous famines of recent years in India have occurred near the period of minimum sun-spots; as, for example, the Orissa famine of 1866, the Behar famine of 1874, and the Madras famine in 1876-77. Similarly, there is a clearly marked tendency for the largest and most intense cyclones to occur shortly before the period of minimum sun-spots; as, for example, the great Calcutta cyclone of 1864, in which 60,000 people were drowned by the storm-wave, and the still larger Backerganj cyclone of 1876, in which 100,000 lives were lost by drowning. As we are now approaching or passing through the same phase of the sun-spot period, it is interesting to inquire whether there are any large abnormal variations common to the present period of minimum sun-spots, and the previous corresponding periods of 1865-66 and 1876-77."

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WE PUBLISH IN THIS NUMBER certain suggestions that have been made, by those best able to judge, as to improvements in the taking of the census of the deaf. At the same time we would call attention to certain suggestions by Dr. A. Graham Bell on the census-taking of the deaf which may lead to important results in the study of the heredity of this affection, and to its introduction into certain families through unfortunate marriages. One of the sections in the article to which we refer has reference to the offspring of first-cousin marriages. This is a point of grave importance, and one upon which, up to this time, no special data have been obtained in this country. The committee of the deaf, as it will be seen, recommends the introduction into the census schedules of a question bearing on this point, and it is certainly to be hoped that such a question will be inserted. In examining the ancestry of deaf-mutes, Dr. Bell has had occasion to consult the original population schedules of former censuses, which are preserved in the Department of the Interior, and he has found little difficulty in tracing the families backward from census to census in the male line of ascent. If the name of the father had been given in former censuses, it might now be possible for genealogical experts to trace from these records the American ancestry of every person now living in the United States in every branch, for the name of the father would give the maiden name of females. Dr. Bell therefore suggests that in the census of 1890 the father's

name should be noted in that part of the schedule that relates to the nativity of the parents, so that the people of the United States may leave to their descendants genealogical records from which their full ancestry may at any time be ascertained. This suggestion is full of interest to the genealogists of the country, and, if carried into effect, would undoubtedly prove of great value to them. The committee of the New England Historical and Genealogical Society, to whom this matter was referred, has strongly indorsed it, and it is hoped that a question on this point, as shown in the proposed schedule, will be inserted.

THE ENUMERATION OF THE DEAF.

A MEETING of the executive committee of the conference of American instructors of the deaf was held in Washington, May 9 of this year, to consider the best method of enumerating the deaf of the next census, and confer with the superintendent of the census, Hon. Robert D. Porter, on the subject. Dr. Alexander Graham Bell and Mr. Frederick Howard Wines were invited to act with the committee. All the members of the committee, including Dr. Bell, were present; but Mr. Wines was unable to attend. After a discussion of several hours and a pleasant interview with Mr. Porter and Dr. J. S. Billings, who has charge of the mortality and vital statistics of the "Eleventh Census," Mr. Porter acceded to the request of the committee, that in the next census the deaf should be separated from the pauper and criminal classes, and promised to give careful consideration to any suggestions the committee might make. In accordance with this, the committee, — consisting of Edward M. Gallaudet, president of the National College for Deaf-Mutes; Isaac Lewis Peet, principal of the New York Institution for the Deaf and Dumb; Philip G. Gillett, superintendent of the Illinois Institution for the Deaf and Dumb; J. L. Noyes, superintendent of the Minnesota School for the Deaf; Caroline A. Yale, principal of the Clarke Institution for the Deaf at Northampton, Mass.; Alexander Graham Bell; and Edward Allen Fay, editor of the *American Annals of the Deaf*, — on June 21, addressed a letter to Mr. Porter, in which they made the following statements and suggestions: —

"At the sixth conference of principals and superintendents of American schools for the deaf, held at Jackson, Miss., April 14-17, 1888, — a body representing all the schools for the deaf in the United States, numbering last year 8,372 pupils, — we were appointed a committee to endeavor to effect a reform in the method of enumerating the deaf in the United States census, in the hope of securing fuller and more accurate statistics in 1890 than have heretofore been obtained. In accordance with your request at our interview on the 9th of May last, that we should make such suggestions as might seem desirable in this direction, we respectfully submit the following recommendations: —

"1. Section 17 of the act of Congress, entitled 'An Act to provide for taking the tenth and subsequent censuses' [approved March 3, 1879], provides that 'Schedule No. 1 (here reproduced) shall contain inquiries . . . as to the physical and mental health of each person enumerated, whether active or disabled, maimed, crippled, bedridden, deaf, dumb, blind, insane, or idiotic, and whether employed or unemployed, and, if unemployed, during what portion of the year.' In accordance with this provision, inquiries were made in the 'Tenth Census' concerning the disabled; and full returns were sought of all the classes named in the act, excepting the deaf and the dumb. Only those dumb were enumerated who were also deaf, and only those deaf who had lost hearing before the age of sixteen years. We urge that in the 'Eleventh Census' all the classes named in the act be fully enumerated; and we specially urge that the returns of the deaf be not limited to that sub-class of the deaf formerly denominated the 'deaf and dumb.' If the requirements of the law are fully complied with, the returns will be much more useful to us, as teachers of the deaf, than if the plan pursued in former censuses of inquiring only for the 'deaf and dumb' is continued. Pupils are admitted to the schools we represent, not on account of their dumbness, but on account of their deafness. Persons who are merely dumb are not received: persons who are merely deaf are received. Our schools are open to

all children of school age who are debarred by deafness from attending ordinary schools for hearing persons. We wish the aid of the census in obtaining the names and post-office addresses of such children, in order to bring them into the special schools suited to their condition.

"2. The age or period of life at which deafness occurred is a

which the deafness occurred. They should be instructed that this point is of such vital importance to the correct classification of the deaf that an answer must be obtained in every case, or a reason assigned for non-reply. This reason may in some cases itself reveal the point desired.

"3. We recommend that in Schedule No. 1 the physical and

FORM OF QUESTIONS USED IN SCHEDULE NO. 1 OF THE TENTH CENSUS [1880.]

HEALTH.			EDUCATION.			NATIVITY.		
15	Is the person [on the day of the Enumerator's visit] sick or temporarily disabled so as to be unable to attend to ordinary business or duties? If so, what is the sickness or disability?		16	Blind, /.		24	Place of birth of this person, naming State or Territory of United States, or the country if of foreign birth.	
17	Deaf and Dumb, /.		21	Attended school within the census year, /.		25	Place of birth of the father of this person, naming the State or Territory of United States, or the country if of foreign birth.	
18	Idiotic, /.		22	Cannot read, /.		26	Place of birth of the mother of this person, naming the State or Territory of United States, or the country if of foreign birth.	
19	Insane, /.		23	Cannot write, /.		27	Were the parents of this person first cousins? Yes, /. No, X.	
20	Maimed, Crippled, Bedridden, or otherwise disabled, /.					28	Name of the father of this person.	

Fig. 1.

SUGGESTED FORM OF QUESTIONS FOR SCHEDULE NO. 1 OF THE ELEVENTH CENSUS [1890].

PHYSICAL AND MENTAL CONDITION.			EDUCATION.			NATIVITY AND PARENTAGE.		
15	Is the person [on the day of the Enumerator's visit] sick or temporarily disabled so as to be unable to attend to ordinary business or duties? If so, what is the sickness or disability?		16	Sight. { Good — Not good / Cannot see well enough to read X.		24	Place of birth of this person, naming State or Territory of United States, or the country if of foreign birth.	
17	Hearing. { Good — Not good / Cannot hear loud conversation X.		21	Attended school within the census year? Yes — No X.		25	Place of birth of the father of this person, naming State or Territory of United States, or the country if of foreign birth.	
18	Speech. { Good — Not good / Cannot speak so as to be understood X.		22	Can this person read? Yes — No X.		26	Place of birth of the mother of this person, naming State or Territory of United States, or the country if of foreign birth.	
19	Mind. { Mental condition good — Not good / Mentally disabled X.		23	Can this person write? Yes — No X.		27	Were the parents of this person first cousins? Yes, /. No, X.	
20	Body. { Physical condition good — Not good / Physically disabled X.					28	Name of the father of this person.	

Fig. 2.

FORM OF QUESTIONS ON DEFECTIVE CLASSES FOR TENTH CENSUS AND PROPOSED FORM FOR ELEVENTH CENSUS COMPARED.

more reliable element in determining the sub-class of the deaf to which a person belongs than the presence or absence of the power of speech, or the exact amount of muteness involved. We therefore recommend, that, in taking a census of the deaf, the enumerators be specially required to ascertain the age or period of life at

mental condition of each person be noted. The form of questions as to physical and mental condition, as shown in Fig. 2, is suggested for incorporation in that schedule. To ascertain the condition of the hearing, the enumerator should be instructed to ask first whether the person can hear well. If the answer is 'Yes,' the

enumerator should indicate the reply by a horizontal mark (—) placed in the 'Hearing' column; if the hearing is not good, by a mark sloping from right to left (/); and if the question is not answered, the column should be left blank. If the hearing is reported as 'not good' (/), the enumerator should then ascertain the extent of the disability. If the person is too deaf to be taught in ordinary schools for hearing persons, or cannot hear conversation in a loud tone of voice, the enumerator should convert the sloping mark (/) into a cross (×), and proceed to put the interrogatories contained in the supplementary schedule or card relating to the deaf (see Paragraph 4, below). If, on the other hand, the person is merely 'hard of hearing,' or if there is doubt whether the deafness is sufficient to constitute the disability above specified, the cross should not be made, and the person should not be entered on the supplementary schedule or card relating to the deaf.

"The condition of the speech should be ascertained and recorded in a similar manner. If the person speaks well, the enumerator should make a horizontal mark (—) in the 'Speech' column; if not, a sloping mark (/); and if the person cannot speak so as to be understood, or cannot speak at all, the sloping mark should be converted into a cross (×).

"The deaf and the dumb would then be indicated as follows, in Schedule No. 1:—

	CONDITION OF THE —				
	Sight.	Hearing.	Speech.	Mind.	Body.
The deaf.....		×			
The dumb (because of deafness).....		×	×		
The dumb (because of idiocy).....			×	×	
The dumb (because of defective vocal organs).....			×		

"The fact that there are three classes of dumb persons shows the liability to error when the enumerator is instructed, as heretofore, to inquire for the 'deaf and dumb.' Out of 29,776 idiots, whose powers of speech were ascertained from physicians in the last census, 7,396, or about one-fourth of the whole number, could not articulate at all, or had no use of spoken language; 14,707, or about one-half, could articulate but imperfectly, or their use of language was very defective; the number who spoke intelligibly was only 7,673. It thus appears that a large proportion of the idiotic are no less 'dumb' than deaf-mutes; and it is almost inevitable, that, when dumbness is made prominent (as in the term 'deaf and dumb'), the one class should be confused with the other, resulting in the return of intelligent deaf-mutes as 'idiotic,' and of idiotic hearing persons as 'deaf and dumb.' In the last census, moreover, 2,339 persons were returned as both 'deaf-mute and idiotic.' It is extremely probable that among these were some deaf-mutes of good mind, and some idiots who could hear. If a census of the deaf is taken, this source of error will be removed. Other advantages of the form of questions above proposed over the former plan of asking for the 'blind, deaf and dumb, idiotic, insane, maimed, crippled, bedridden, or otherwise disabled,' are explained in Dr. Alexander Graham Bell's communication to Senator Hale (Paragraphs 20-39), which was published in *Science* of Jan. 18.

"4. Mr. F. H. Wines of Springfield, Ill., special agent of the "Tenth Census," in charge of the statistics relating to the deaf and other special classes of the population, who was invited to act with this committee, but was unable to be present at our meeting, suggested to us by letter, that, instead of supplementary schedules, the enumerators should be provided with special cards, on which the questions to be asked in the case of each deaf person should be printed, with spaces for the answers; and that the enumerators be required to fill out these cards in duplicate, — one copy for use, and the other for preservation. We approve of the suggestion of special cards, and recommend the following form, in addition to such references as may be necessary for identification with Schedule No. 1.

[Face of Card.]

[This space may be used for the necessary references for identification with Schedule No. 1.]

THE DEAF.

Instructions to the Enumerator.

Note A. — The questions on this card should be asked in the case of every person who is too deaf to be taught in ordinary schools for hearing persons, or who cannot hear conversation in a loud tone of voice.

Note B. — Question No. 5 is very important, and every possible effort must be made to obtain a correct answer.

If the person was born deaf, write B; if not, state the age at which the hearing was lost.

If it is difficult to find out the exact age at which the person became deaf, ask *at what period of life* deafness occurred; as, for instance, whether it was in infancy (under 4 years of age), in childhood (under 10), in youth (under 20), in adult life (from 20 to 50), or in old age.

If you cannot get an answer to Question No. 5, state here the reason why you cannot.

Note C. — In answering Question No. 8, use the same check-marks as in Schedule No. 1.

1. Name of the deaf person?
2. Residence when at home: Town? County? State? Post-office address?
3. Name of this person's father?

[Reverse of Card.]

4. Race or color of this person? Sex? Age?
5. At what age or period of life did this person become deaf? [See *Note B.*]
6. Cause of deafness?
7. Did the deafness result from military service?
8. Physical and mental condition [see *Note C.*]. Sight? Hearing? Speech? Mind? Body?
9. Can this person hear sufficiently to perceive a warning shout in case of danger?
10. Is this person educated? Where taught?
11. What is this person's occupation?
12. Monthly earnings? \$ Value of property? \$
13. Is this person a pauper?
14. Were the parents of this person first-cousins?
15. Has this person had any deaf brothers or sisters?
16. Is this person single (s); married (m); widowed (wid); or divorced (d)? If married, name of the wife (or husband)?
17. Name of the wife's (or husband's) father?
18. Has the wife (or husband) had any deaf brothers or sisters?
19. How many children have been born of this marriage? How many of the children were deaf? How many died young?
20. Is the wife (or husband) deaf? If so, became deaf at what age or period of life? [See *Note B.*]

"5. In addition to the statistics gathered by the enumerators, much valuable information relating to the deaf can be obtained by means of inquiries addressed to principals of schools for the deaf, teachers of common schools, physicians, and intelligent deaf persons. We recommend that special cards with suitable questions be addressed to each of these classes of persons.

"6. We recommend that some one thoroughly qualified by familiarity with the deaf be placed in charge of the entire work of the census relating to this class.

"7. We recommend that in the publication of the results of the census the deaf be separated from the pauper and criminal classes.

"8. In the last census, 4,597 persons were returned as doubly or trebly afflicted with deaf-mutism, idiocy, insanity, and blindness. Those who were returned as 'deaf and dumb and idiotic' were reported among 'the deaf and dumb' and again among 'the idiotic,' etc.; each of the doubly afflicted persons being thus counted twice, and each of the trebly afflicted persons thrice. In this way the 4,597 doubly and trebly afflicted persons counted in the summing-up of the insane, idiots, blind, and deaf-mutes ('Tenth Census,' vol. xxi. p. vii.), as 9,441 persons, more than double their actual number, making the total of these classes appear greater by 4,844 individuals than it really was. In order to insure accuracy with

respect to these classes, we recommend that the returns of persons doubly and trebly afflicted be not classed with the deaf, the idiotic, etc., respectively, but be grouped in classes by themselves, and placed in charge of some specially qualified person for the careful examination and verification of the returns, and for an investigation into the causes of these terrible afflictions.

"9. An impression is prevalent that deafness, blindness, idiocy, and insanity are often due to consanguinity in the parents; and statistics have been collected which show that a considerable percentage of the deaf, blind, idiotic, and insane are the children of first-cousins. These statistics, however, can be of little value in determining the questions involved until we know what percentage of the general population are the offspring of such unions. We therefore recommend that in Schedule No. 1 the question be asked, 'Were the parents of this person first-cousins?'

"We trust that these suggestions will commend themselves to your judgment, and believe that, if adopted, they will result in a more accurate and satisfactory census of the class in whose welfare we are especially interested than has yet been obtained."

HEALTH MATTERS.

Baking Bacilli.

AT a meeting of the New York Academy of Medicine, June 20, Dr. A. Jacobi read some notes on the baking of bacilli, being a denunciation of Weigert's advertising scheme, and a review of his own experience with the inhalation of hot air in the treatment of phthisis. Weigert, supposed to be an American physician, now of Germany, claimed to have discovered a method of curing phthisis by the inhalation of hot air, and he had made free use of Dr. Jacobi's name in advertising his apparatus for carrying out this treatment. The treatment was not original with Weigert; nor had Dr. Jacobi, as had been asserted, bought, indorsed, or recommended the apparatus in question. Moreover, as appeared further along, he had little confidence in the method. To Halter belonged the honor of suggesting the treatment of phthisis by the inhalation of hot air with the view of killing the bacilli in the lungs. The idea arose from observing the immunity from phthisis of workmen in a lime-kiln where they were exposed to a high degree of heat (122° to 158° F.),—so high that it would destroy the tubercle bacilli, provided it continued at that degree until it had reached the lungs. The air inhaled by workmen in a lime-kiln was dry and rarefied. A moist atmosphere of a like temperature would be more destructive of the bacilli, but was less endurable by the phthisical patient. Dr. Jacobi said, that, having been requested to admit Weigert's apparatus into his wards at Bellevue Hospital, he did experiment with it some time ago, and for a while the results made a favorable impression on the physicians in attendance, for the patients, or a part of them, seemed to improve under the treatment. More careful observation, however, showed that the improvement was doubtless due to rest in the hospital, in an atmosphere much purer than that in which the patients had lived in their tenement homes. The instrument itself was not as good as that which one of ordinary ingenuity could improvise. The atmosphere on its way to the lungs from the flame was found to have fallen from above 300° F. to about the temperature of the body when it had reached the mouth. Of course, if it were above the temperature of the blood, it would become further cooled on its passage toward the lungs. Some of the hot air might get into the alveoli, but very little. In order to obtain benefit from such treatment, it would be necessary not only that the air inhaled be of a high temperature, but that the patient be in a room in which the thermometer registered at least 105.5° F.: in other words, it would be necessary to produce a sort of artificial fever, and it was evident that such treatment must prove injurious to any other than patients in the very first stage of phthisis.

Professor Huxley and M. Pasteur on Hydrophobia.

On Monday, July 1, a meeting called by the lord mayor of London to hear statements from men of science with regard to the recent increase of rabies in England, and the efficiency of the treatment discovered by M. Pasteur for the prevention of hydrophobia, was held at the Mansion House. Several letters were read from those who were unable to attend. Among these letters was one from

Professor Huxley, in which he says, "I greatly regret my inability to be present at the meeting which is to be held, under your lordship's auspices, in reference to M. Pasteur and his institute. The unremitting labors of that eminent Frenchman during the last half-century have yielded rich harvests of new truths, and are models of exact and refined research. As such they deserve, and have received, all the honors which those who are the best judges of their purely scientific merits are able to bestow. But it so happens that these subtle and patient searchings-out of the ways of the infinitely little—of that swarming life where the creature that measures one-thousandth part of an inch is a giant—have also yielded results of supreme practical importance. The path of M. Pasteur's investigations is strewn with gifts of vast monetary value to the silk-trader, the brewer, and the wine merchant; and, this being so, it might well be a proper and a graceful act, on the part of the representatives of trade and commerce in its greatest centre, to make some public recognition of M. Pasteur's services, even if there were nothing further to be said about them. But there is much more to be said. M. Pasteur's direct and indirect contributions to our knowledge of the causes of diseased states, and of the means of preventing their occurrence, are not measurable by money values, but by those of healthy life and diminished suffering to men. Medicine, surgery, and hygiene have all been powerfully affected by M. Pasteur's work, which has culminated in his method of treating hydrophobia. I cannot conceive that any competently instructed person can consider M. Pasteur's labors in this direction without arriving at the conclusion, that, if any man has earned the praise and honor of his fellows, he has. I find it no less difficult to imagine that our wealthy country should be other than ashamed to continue to allow its citizens to profit by the treatment freely given at the institute without contributing to its support. Opposition to the proposals which your lordship sanctions would be equally inconceivable if it arose out of nothing but the facts of the case thus presented. But the opposition which, as I see from the English papers, is threatened, has really, for the most part, nothing on earth to do either with M. Pasteur's merits or with the efficacy of his method of treating hydrophobia. It proceeds partly from the fanatics of *laissez faire*, who think it better to rot and die than to be kept whole and lively by State interference, partly from the blind opponents of properly conducted physiological experimentation, who prefer that men should suffer rather than rabbits or dogs, and partly from those who for other but not less powerful motives hate every thing which contributes to prove the value of strictly scientific methods of inquiry in all those questions which affect the welfare of society. I sincerely trust that the good sense of the meeting over which your lordship will preside will preserve it from being influenced by these unworthy antagonisms, and that the just and benevolent enterprise you have undertaken may have a happy issue."

M. Pasteur, in a letter dated Paris, the 27th ult., and read by Sir H. Roscoe, writes, "I am obliged by your sending me a copy of the letter of invitation issued by the lord mayor for the meeting on July 1. Its perusal has given me great pleasure. The questions relating to the prophylactic treatment for hydrophobia in persons who have been bitten, and the steps which ought to be taken to stamp out the disease, are discussed in a manner both exact and judicious. Seeing that hydrophobia has existed in England for a long time, and that medical science has failed to ward off the occurrence even of the premonitory symptoms, it is clear that the prophylactic method of treating this malady which I have discovered ought to be adopted in the case of every person bitten by a rabid animal. The treatment required by this method is painless during the whole of its course, and not disagreeable. In the early days of the application of this method, contradictions such as invariably take place with every new discovery were found to occur, and especially for the reason that it is not every bite by a rabid animal which gives rise to a fatal outburst of hydrophobia: hence prejudiced people may pretend that all the successful cases of treatment were cases in which the natural contagion of the disease had not taken effect. This specious reasoning has gradually lost its force with the continually increasing number of persons treated. To-day, and speaking solely for the one anti-rabic laboratory of Paris, this total number exceeds 7,000; or exactly, up to the 31st of May, 1889, 6,950. Of

these, the total number of deaths was only 71. It is only by palpable and wilful misrepresentation that a number differing from the above, and differing by more than double, has been published by those who are systematic enemies of the method. In short, the general mortality applicable to the whole of the operations is 1 per cent; and, if we subtract from the total number of deaths those of persons in whom the symptoms of hydrophobia appeared a few days after the treatment, — that is to say, cases in which hydrophobia had burst out (often owing to delay in arrival) before the curative process was completed, — the general mortality is reduced to .68 per cent. But let us for the present only consider the facts relating to the English subjects whom we have treated in Paris. Up to May 31, 1889, their total number was 214. Of these, there have been five unsuccessful cases after completion of the treatment, and two more during treatment, or a total mortality of 3.2 per cent, or, more properly, 2.3 per cent. But the method of treatment has been continually undergoing improvement; so that in 1888 and 1889, on a total of sixty-four English persons bitten by mad dogs and treated in Paris, not a single case has succumbed, although among these sixty-four there were ten individuals bitten on the head, and fifty-four bitten on the limbs, often to a very serious extent. I have already said that the lord mayor, in his invitation, has treated the subject in a judicious manner, from the double point of view of prophylaxis after the bite and of the extinction of the disease by administrative measures. It is also my own profound conviction that a rigorous observance of simple police regulations would altogether stamp out hydrophobia in a country like the British Isles. Why am I so confident of this? Because, in spite of an old-fashioned and widespread prejudice, to which even science has sometimes given a mistaken countenance, rabies is never spontaneous. It is caused, without a single exception, by the bite of an animal affected with the malady. It is needless to say that in the beginning there must have been a first case of hydrophobia. This is certain; but to try to solve this problem is to raise uselessly the question of the origin of life itself. It is sufficient for me here, in order to prove the truth of my assertion, to remind you that neither in Norway, nor in Sweden, nor in Australia, does rabies exist; and yet nothing would be easier than to introduce this terrible disease into those countries by importing a few mad dogs. Let England, which has exterminated its wolves, make a vigorous effort, and it will easily succeed in extirpating rabies. If firmly resolved to do so, your country may secure this great benefit in a few years; but, until that has been accomplished, and in the present state of science, it is absolutely necessary that all persons bitten by mad dogs should be compelled to undergo the anti-rabic treatment. Such, it seems, is a summary of the statement of the case by the lord mayor. The Pasteur Institute is profoundly touched by the movement in support of the meeting. The interest which his royal Highness the Prince of Wales has evinced in the proposed manifestation is of itself enough to secure its success. Allow me, my dear colleague, to express my feelings of affectionate devotion."

BOOK-REVIEWS.

Der Hypnotismus. Von Dr. Med. ALBERT MALL. Berlin. 8°.

THE modern study of hypnotism may now be said to have outgrown the limits of its birthplace, France, and to have acquired that universal recognition that belongs to a scientifically established body of doctrines. The attitude of Germany towards these extremely fascinating experiments and results was at first suspicious, then rather adversely critical. Now, while retaining a judicious scepticism regarding the more surprising results, German scholars have come to recognize the intrinsic value of hypnotism as a psychologic method, as well as the importance of the place it occupies in modern psychology.

The German literature consists in the main of single contributions, partly critical and partly original, dealing with single phases of the various hypnotic conditions. There have been but few general treatises aiming at a convenient *résumé* of what has been established, and the present work by Dr. Mall is a rather successful attempt to supply this lack.

The work is methodically arranged, intelligibly written, but is

defective in laying too much stress upon individual minor points of special interest to the author, and in a lack of clear distinctions between the important and the subsidiary, perhaps uncertain points.

After a brief historical introduction, in which some hitherto neglected points in the history of hypnotism in Germany are noted, the general symptoms of the hypnotic conditions are described. The various stages are distinguished as to their intensity merely, no other criterion as yet offered being found satisfactory. The more detailed description consists of a physiological and a psychological portion. In the former the changes in the movements and sensations, in the latter effects brought about in the region of memory association and more complicated processes, are described. This is naturally the most important part of the work, and is a useful *résumé* of the position taken by the Nancy school. The processes are described throughout as explicable on the ground of suggestion, conscious or unconscious. The rôle of the latter is particularly important, and finds here due recognition. A further point of view pervading the entire exposition is the assimilation of psychic and physiological conditions observed in hypnotism with analogous occurrences in sleep and waking life. This analogy with the phenomena of normal sleep is both real and important; and, while it does not warrant our regarding hypnotism as something entirely normal, it ought to remove the usual view that places it entirely in the region of pathology.

The latter half of the work deals with various aspects of hypnotic study, its theoretical bearings, its practical bearings as a therapeutic agent, its forensic aspect as a means of concealing crime, the allied conditions found in the lower animals, and so on. While some of the opinions there set forth will doubtless have to be modified, the work none the less reflects the present state of knowledge very well. The work is not original, except in its arrangement and the various degrees of importance it attaches to different results of experimentation. The chief objection to its use by the laity is the rather uncritical collation of good and indifferent works, of important and trivial points. As a contribution to the German literature on hypnotism, it is welcome, and will find use.

AMONG THE PUBLISHERS.

A HOST of boys and girls under eighteen years of age have been profiting themselves, and at the same time entertaining their teachers, parents, and friends, by telling prize-stories in *Treasure Trove Magazine* of New York. They have won cash prizes to the extent of two hundred dollars, besides seventy dollars' worth of books. Story-telling as a means of education is taking a first place in the regular exercises of our public schools, where the usually irksome task of composition-writing, upon which so many other studies depend, has been turned by these prize-story competitions into a genuine pastime.

— *Babyhood* for July contains much seasonable advice for mothers of young children, the question of where to go and where not to go during the summer months being thoroughly discussed. "Botany for the Little Ones" is continued, and there are entertaining and instructive contributions concerning the many perplexing questions that are apt to arise at the present time in the city nursery as well as in the temporary country home.

— Messrs. E. & F. N. Spon announce as in preparation "Chemical Technology: the Application of Chemistry to the Arts and Manufactures," by C. E. Groves and William Thorp (about 8 volumes); and "Egyptian Irrigation," by W. Willcocks, M.I.C.E., with introduction by Lieut.-Col. J. C. Ross, R.E., C.M.G., being a physical description of Egypt, with particulars of various methods of irrigation and drainage, and full details of engineering construction, and illustrated by numerous plates. They also announce as nearly ready, "The Engineer's Sketch-Book of Mechanical Movements, Devices, Appliances, and Contrivances," by Thomas Walter Barber, containing details employed in the design and construction of machinery for every purpose; collected from numerous sources and from actual work; classified and arranged for reference for the use of engineers, mechanical draughtsmen, managers, mechanics, inventors, patent agents, and all engaged in the mechanical

arts; with nearly two thousand illustrations, descriptive notes, and memoranda: and as ready July 1, "Practical Gold Mining: a Comprehensive Treatise on the Origin and Occurrence of Gold-Bearing Gravels, Rocks, and Ores, and the Methods by which the Gold is Extracted," by C. G. Warnford Lock, illustrated by numerous plates and engravings.

— The frontispiece of the August issue of *Scribner's Magazine* will be a striking portrait of Lord Tennyson, engraved by Kruell from a recent photograph. Recognition is thus made of Tennyson's eightieth birthday, which occurs in August. The same number will contain a short essay by Dr. Henry van Dyke on Tennyson's earliest poems published with his brother; and the end paper, by Professor T. R. Lounsbury of Yale, will discuss Tennyson's attitude toward life in youth and old age, under the title of "The Two Locksley Halls." The time has arrived when every one wants to know what is being done to advance and extend the art of electric lighting, and President Henry Morton of Stevens Institute, in his article in the same number of *Scribner's*, will explain some of the most recent achievements. He will describe such matters as lighting the Hoosac Tunnel with glow-lamps, the lighting of Hell Gate, of the great public squares, and other interesting undertakings, all very fully illustrated. James Dwight, M.D., a leading authority in this country and England, on the game of lawn tennis, will contribute a careful study of "Form in Lawn Tennis," based on a series of instantaneous photographs of the best players at work, showing the exact position taken in making all the principal strokes. Models for these photographs were Mr. R. D. Sears, the late champion, assisted by his brother, Mr. P. S. Sears, and Mr. Thomas Pettitt, the professional tennis champion. These have been excellently engraved, and are very picturesque as well as of great value to tennis players. Benjamin Norton, the nephew of Austin Corbin, and second vice-president of the Long Island Railway, will contribute a short paper entitled "How to Feed a Railway," which will describe the purchasing and supply department. The closing article in the railway series will appear in the September number under the title of "Safety Appliances in Railroad Working," by H. G. Prout, editor of the *Railroad Gazette*.

— "The Spirit of Manual Training" will be set forth by Professor C. H. Henderson of Philadelphia, in an article which is to open the August *Popular Science Monthly*. Professor Henderson says that the ideal school will aim to develop men, not to produce fine articles of wood or iron, or to cram heads with information, and that the name "manual-training school" does not rightly describe an institution designed to train the "whole boy." Professor Huxley will review the main points of the controversy in which he has been engaged, in an article entitled "Agnosticism and Christianity." Some of Cardinal Newman's writings will receive a share of caustic criticism in this paper. A suggestive article on "The Wastes of Modern Civilization," by Felix L. Oswald, M.D., will appear, in which Dr. Oswald will point out a number of ways in which the resources of the modern world are used up, with no care for their replenishment, or in producing useless or harmful results; and "Mr. Mallock on Optimism" is the title of a critical article which Mr. W. D. Le Sueur will contribute to the August *Popular Science*. It repels the assertions of Mr. Mallock, that there is not sufficient reason for being gratified with the prospects of the human race, and that no meaning in life can be seen without the light of theological faith.

— Messrs. Ginn & Co. announce for publication in August "The Irregular Verbs of Attic Prose, their Forms, Prominent Meanings, and Important Compounds, together with Lists of Related Words and English Derivatives," by Addison Hogue, professor of Greek in the University of Mississippi. The material treated in this book is here much fuller than in the lists of irregular verbs in the grammars, and much more accessible than in the lexicons. The book contains, after the regular verbs, — pure, mute, and liquid, — the irregular verbs of Attic prose in alphabetical order. Prominent meanings and special uses of frequent occurrence are given, often illustrated by translated examples. The most important compounds are added, and also many related words, forming a very practical sort of introduction to word-formation. The first declen-

sion alone is represented by about 400 substantives, and this indicates the range of vocabulary. The English derivatives, of which there are over 450, will prove, it is hoped, an attractive feature to teachers and students alike. To the latter they will be an additional support in learning some five or six hundred Greek words, and will broaden their knowledge of their own tongue.

— At this time, when the centennial anniversaries of the various events connected with the beginning of the French Revolution are coming so thick and fast, many who desire to make new studies of that great period of history will get help from the Old South leaflet on the French Revolution, issued by the directors of the Old South Studies in History, and published by D. C. Heath & Co. This little sixteen-page leaflet, which is sold for five cents, contains one of the powerful chapters from Carlyle's history, on the condition of France on the eve of the Revolution, brief extracts from John Morley and others, and several pages of historical and bibliographical notes by Mr. Edwin D. Mead. All the important books upon the Revolution are noticed, with brief estimates of their several merits; the French Revolution is compared with the English Revolution of 1688 and with the American Revolution; and a special section is devoted to the various significant events taking place in the world in the eighteenth century, which will prove useful for fixing in the minds of students some important dates worth remembering in relation to each other.

— The *Quarterly Journal of Economics* (Boston, George H. Ellis) closes its third year with the July number. Edward Cummings contributes a study of the present condition of the English trades-unions, made with great advantages on the spot; Professor Dunbar reviews the history of the direct taxes of the United States, from the tax of 1798 to the last, in 1861; Stuart Wood develops his new theory of wages; and several notes on a variety of topics follow, including one by the new president of Brown University, Professor Andrews, on the late copper syndicate. The usual full bibliography and copious indexes for the volume fill the remaining pages.

— The *Educational Times* (London) says, "We cannot be too lavish in our praise of the series of Greek authors now being published by Messrs. Ginn & Co. The book before us [*Homer's Odyssey*, Books I. — IV., by B. Perrin] forms one of this series, and is in no way inferior in binding, paper, printing, and general style, to the other productions of this firm, which we have previously noticed with real pleasure. The notes and appendices furnish considerable material for the higher criticism of the poem, but at the same time sufficient assistance of an elementary character has been provided to make the volume useful as an introduction to the study of Homer. Text and notes appear on the same page, which does not seem to us a good plan; but, to make the work thoroughly complete, with each edition of text and notes the purchaser receives a separate copy containing the text only, and, since this text edition can only be obtained separately at a very small cost, we heartily recommend it to our readers."

— We have received from the Theosophical Book Company of Boston a pamphlet entitled "Light on the Path," which is intended as an initiation into the mysteries of occultism. It is said to have been "written down by M. C.," the real author, we suppose, being some supermundane intelligence. The actual contents of the pamphlet are in part taken from Buddhism and other Eastern systems, and in part concocted by the author himself. The Buddhist doctrine of Karma is taught, and the reader is also told that he must kill out every kind of earthly desire. Besides these two tenets of Buddhism, various precepts are set forth, of which the following are specimens: "Hold fast to that which is neither substance nor existence. Listen only to the voice which is soundless. Look only on that which is invisible alike to the inner and the outer sense" (p. 17). The whole work, we are told, "is written in an astral cipher, and can therefore only be deciphered by one who reads aurally; and we should think so. At the end of the pamphlet is a catalogue of the books issued by the publishers, to which they prefix this request: "Send us the addresses of those among your acquaintances who might be interested in the class of literature of which we make a specialty." So if any of our readers

choose to make a list of the fools they know, they can send it to the Theosophical Book Company.

— John Wiley & Sons announce as ready, "A Treatise on the Ordinary and Partial Differential Equations," by William Woolsey Johnson, professor of mathematics in the United States Naval Academy, Annapolis, Md.; "Submarine Mines and Torpedoes as applied to Harbor Defence," by John Townsend Bucknill, lieutenant-colonel Royal Engineers; "Elements of the Art of War," prepared for the use of the cadets of the United States Military Academy, West Point, N.Y., by James Mercur, professor of civil and military engineering; "A Laboratory Guide in Chemical Analysis," by David O'Brine, professor of chemistry in Colorado State Agricultural College; and "A History of the Planing-Mill," with practical suggestions for the construction, care, and management of wood-working machinery, by C. R. Tompkins, M.E.

— Messrs. Longmans, Green, & Co. announce that they have made arrangements to supplement their series, Epochs of Modern History, by a short series of books treating of the history of America, which will be published under the general title "Epochs of American History." The series will be under the editorship of Dr. Albert Bushnell Hart, assistant professor of history in Harvard College. Each volume will contain about two hundred and fifty pages, similar in size and style to the page of the volumes in the Epochs of History Series, with full marginal analysis, working bibliographies, maps, introductions, and index. The volumes will be issued separately, and each will be complete in itself. Those already arranged for will, it is hoped, provide a continuous history of the United States from the foundation of the Colonies to the present time, which shall be suited to class use as well as for general reading and reference. The volumes in preparation are as follows: "The Colonies (1492-1763)," by Reuben Gold Thwaites, secretary of the State Historical Society of Wisconsin, author of "Historic Waterways," etc.; "Formation of the Union (1763-1829)," by Albert Bushnell Hart, A.B., Ph.D., the editor of the series; and "Division and Re-union (1829-1889)," by Woodrow Wilson, Ph.D., LL.D., professor of history and political economy in Wesleyan University, Middletown, Conn., author of "Congressional Government," etc.

LETTERS TO THE EDITOR.

Are Beech-Trees ever struck by Lightning?

THIS is the question implied in your note on p. 7 of *Science* for July 5, 1889.

In August, 1885, at Mason, Ingham County, Mich., a number of men were at work harvesting wheat in a large field west of the village.

A heavy thunder-storm came up, and all but one of them, Aura Hines, fled for shelter to a saw-mill about a quarter of a mile distant. He said that his shoes hurt his feet, and he did not like to run so far; he would go to the woods, which bounded the field south, not far distant. After the storm (accompanied with heavy thunder and lightning) had passed, the men returned from the mill

to their work, but Hines did not appear. They went in search, and found him sitting under and against a large beech-tree, dead.

Without disturbing his position, they sent to the village for help, and I went and saw him.

The tree was a large and tall one, about two feet in diameter, and leaned a little eastward. A pile of brushwood had been burned on the east side, which had killed the tree on that side from the roots to the height of seven feet from the ground. The storm came from westward, and Hines sat on the east side crouched against the tree, which sheltered him from the rain. Two or three holes of half an inch diameter, near his right foot, showed where the current passed from the earth to his body, partly tearing the sole from his shoe, and passing through the crown of the coarse straw hat on his head, making a half-inch hole, as if a bullet had been fired through it; the broken straws pointing upward and outward.

There was a plain furrowed trace on the burned and dead bark of the tree above his head, to the green and living wood, but no farther.

The wood of the beech is very close grained, and in the living tree full of sap, and the green bark is also filled with sap, while the outer or ross bark is thin and quite smooth.

Has not such a tree the elements of a good conductor, over which the electric fluid passes, without shattering it or leaving a trace?

If this is true, beech-trees are probably struck by lightning as often as any others, but it leaves no trace of its passage over them.

H. D. POST.

Holland, Mich., July 14.

A Navajo Tree-Burial.

FOR a number of years I enjoyed the opportunity of studying the customs and traditions of three or four tribes of Indians in the vicinity of Fort Wingate, N. Mex., and during that period became very familiar with the method of disposing of their dead resorted to by the Navajos, one of the tribes to which I refer. They are, as we know, "cliff-buriers," as I have elsewhere described; and personally I never met with a case where they do not bury their deceased — men, women, and children — in the more capacious rents in the rocky cañons of the mountain-sides, where this tribe now inhabits. Recently, however, a well-authenticated case has been sent me where the Navajos had buried one of their dead children in a tree. This was done not long ago, only about a mile from Fort Wingate, and was discovered by Mr. Benjamin Wittick, who has taken an admirable photograph of the tree and the locality. The body of the child had been deposited, after having been wrapped in cloth and blankets, longitudinally on the limb of a large piñon-tree, about fifteen feet above the ground. A rude platform of dead and broken limbs was constructed to hold the body in position. Indeed, in all particulars the burial is characterized as a typical tree-burial, and is interesting from the fact that it constitutes such a remarkable departure from the general mortuary custom of that tribe of our Indians.

Takoma, D.C., July 16.

R. W. SHUFELDT.

INDUSTRIAL NOTES.

New Outfit of Electrical Engineering Apparatus for Princeton College.

MESSRS. JAMES W. QUEEN & CO. of Philadelphia, the well-known manufacturers and importers of electrical test instruments, report the sale of a bill of goods amounting to four thousand dollars to Princeton College for the equipment of their course in electrical engineering to be inaugurated in September next. The list embraces several of Queen's large Wheatstone bridge sets as devised by Professor William A. Anthony, and pronounced by Professor B. F. Thomas of Ohio State University "to be superior to Elliott's Dial Form." These sets, as well as several of the next size smaller, also ordered by Princeton College, are all guaranteed by Professor Anthony to be accurate within $\frac{1}{100}$ of one per cent. There is also a large \$375 reflecting galvanometer made for the special purpose of measuring high insulation resistance, the galvanometer itself having a resistance of 500,000 ohms. This will be

the only instrument of this character in the United States. For measuring induction co-efficients, etc., there is provided one of Ayrton & Perry's Secohmmeters. For the determination of magnetic constants there is a large Weber earth inductor which will be used, in addition to the Kew magnetometer already possessed by the physical department. There is also a Kohlrausch unifilar electro dynamometer for the measurement of very weak currents, such as those used in telephone work, etc. This suspension has the minimum amount of torsion as the current is conveyed out of the instrument by means of a platinum strip attached to the movable coil, and dipping into a dilute solution of sulphuric acid. A pair of Wiedemann's large dead beat reflecting galvanometers, Sir William Thomson's astatic reflecting galvanometer, one of Elliott's differential galvanometers as well as his ballistic instrument, a Wheatstone Kirchoff cylinder bridge, Kohlrausch's mirror differential galvanometer, condensers, telescopes, etc., go to make up the remainder of as fine an outfit of electrical test apparatus as has ever been sold at any one time in this country.